

# CBRNe

February 2013

# WORLD

All Hazard  
Response 2013  
see pages 25 to 29



\$15

**C-Water**

Chemical contamination of water

**B-Careful**

Threat status in Syria and Iran

**R-Not**

Reducing Rad Contamination



Andy Johnston evaluates the progress made by the Lawrence Livermore National Laboratory to combat CBRNE terrorism

# Institution Spotlight

Following 9/11, US laboratory programmes focussing on counter-terrorism and counterproliferation gained momentum, and the development of new technologies for biological, chemical, explosives and nuclear detection were fast-tracked. The Lawrence Livermore National Laboratory (LLNL) is now a key developer of technical capabilities to protect the US against such terrorist attacks.

The LLNL was established in 1952 at the height of the Cold War to meet US national security needs by advancing nuclear weapons science and technology. Renowned physicists E.O. Lawrence and Edward Teller established this national laboratory to augment the efforts of the laboratory at Los Alamos, New Mexico. At this laboratory, on the Berkeley campus of the University of California, Lawrence created a model of how large-scale

science should be pursued, with an emphasis on multidisciplinary, team efforts. Following this model, LLNL made its first major breakthrough in the 1950s with the design of a thermonuclear warhead for missiles, which could be launched from highly-survivable submarines. The Laboratory went on to develop the first high-yield warheads that were compact enough to be carried, several at a time, on each ballistic missile. The LLNL is, therefore, no stranger to ground-breaking research. Any nuclear scientist worth his salt knows, in a world of changing and increasingly asymmetric threats, that LLNL continues to lead the pack in the development of counter-terrorist measures.

In recent years, the LLNL continues to advance and apply science and technology to ensure US national security within a global context. The Laboratory successfully completed a life-extension programme for the US's most modern Intercontinental Ballistic Missile (ICBM) warhead that will undoubtedly remain in the US strategic arsenal well into the 21st century.

## Research summary

LLNL scientists and engineers lie at the heart of this laboratory's innovations and their commitment to US national security is as strong as ever, despite the fact that the focus of their research and the nature of the global terrorist threat have changed since the 1950s.

Specifically, the LLNL's mission is to:

- Enhance US national defense.
- Reduce the global threat from terrorism and weapons of mass destruction.
- Respond with vision, quality, integrity and technical excellence to scientific issues of national importance.

## CBRNE and counter-terrorism at LLNL

LLNL's role in counter-terrorism began nearly thirty years ago with the formation of the Nuclear Emergency Search Teams (NEST), as well as the



*LLNL has come out of the shadow of its nuclear past to deal with the whole CBRN spectrum ©LLNL*

All Hazard Response, 16-17 April 2013, Dublin, Ireland. More information on [www.cbrneworld.com/events](http://www.cbrneworld.com/events)



LLNL has three aims, biosurveillance, MedCM and risk analysis ©LLNL

related Nuclear Assessment activities. More recently, their counter-terrorism programmes have expanded to cover a wide range of disciplines, such as threat and risk assessments, detection of threat materials, understanding and mitigating the consequences of attacks and forensic analysis to aid in the attribution of responsibility.

Research into nuclear materials has always been at the centre of LLNL research and, to date, their contribution to the understanding of nuclear terrorism has been impressive. In 2012, a team of LLNL researchers announced that they had developed the first plastic material capable of efficiently distinguishing neutrons from gamma rays – something not thought possible for the past five decades or so. As a result, the new technology might assist in detecting nuclear substances such as plutonium and uranium, which might be used in improvised nuclear devices by terrorists. It could also help to detect neutrons in major scientific projects.

LLNL is not solely focussed on nuclear issues of course. When it comes to CBRN, their work encompasses chemical, biological, radiological and high-explosive threats as well. LLNL scientists have a long history of developing, deploying and delivering advanced, bio-defense capabilities in the US. They have established a five-year roadmap to

significantly expand the current US bio-security programme and aim to be recognised as the premier national laboratory for bio-security. LLNL have their work cut out over the next few years, but without doubt have the knowledge and capability to achieve this goal.

Currently, Livermore has teamed up with academia, industry and other government agencies throughout the US to anticipate and meet the challenges of mitigating the evolving biological threat. LLNL has laid out its three main aims to meet the challenges of providing bio-security. Specifically they aim to provide:

- Rapid detection and characterisation of emerging and unknown threats by enabling a global disease surveillance system that will significantly reduce the time it takes to detect and characterise an emerging or unknown pathogen.
- Speedier development of new medical countermeasures by dramatically reducing the time required to develop medical countermeasures for new pathogens by addressing key scientific barriers in the drug discovery and development process.
- Greatly improved science to underpin threat assessment and risk analyses by becoming the leading provider of biological risk analysis through science-based threat characterisation, simulation and intelligence analysis.

This collaboration with other institutions has enabled LLNL to develop technologies that rapidly detect a pathogen after release such as microarrays, antidotes and medical countermeasures for people exposed to them. These technologies also have the capacity to process samples with possible bioterrorist agents, technologies and standards for cleaning contaminated facilities, as well as the preparation of authoritative analyses to understand potential threats. "We continue to look at technologies such as microarrays to address the evolving and advanced biological threats," said LLNL's David Rakestraw, the Programme Manager for the "S" programme. "Currently," he added, "the BioWatch system looks for a fixed number of threats. In the future, the threat space will be much larger and require us to look at hundreds or thousands of potential signatures for detection."

#### LLNL forensics:

LLNL is also active in forensics research and development, particularly with regard to CWA identification. Science can often produce improbable bedfellows and certain elements of the research at LLNL testify to this. A good example is a study that has its origins in researching stellar nucleosynthesis processes captured in grains of stardust has morphed into a forensic tool for establishing the isotopic composition of weaponised nuclear material here on earth.